

PATENT SPECIFICATION

DRAWINGS ATTACHED

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COMPLETE SPECIFICATION

Improvements in or relating to Methods of and/or Apparatus for Conveying Articles

- We, CO-OPERATIVE WHOLESALE SOCIETY LIMITED, an industrial and provident Society incorporated in the United Kingdom having its registered office at No. 1 Balloon Street in the City of Manchester, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—
- This invention relates to methods of and/or apparatus for conveying articles, which method and apparatus have been designed particularly although not solely for conveying packaged meat through a freezing chamber.
- Present known conveying means for use in for example blast freezing tunnels have the disadvantage of incorporating mechanical driving means such as cogs and driving chains and the low operating temperatures experienced in such freezing chambers result in a considerable risk of mechanical failure. Also driving means of the type above referred to require considerable space, and of course space is at a premium particularly in a freezing chamber.
- It is therefore an object of the present invention to provide methods of and/or apparatus for conveying articles which will at least considerably reduce the abovementioned disadvantages in a simple and yet effective manner.
- Accordingly in one aspect the invention consists in a method of freezing articles comprising the steps of loading a rack or the like holding means with articles to be frozen, moving said loaded rack or the like holding means to a position ready to be passed into one conveying path, applying a force to cause said rack or the like holding means to enter said conveying path through a blast freeze tunnel and by displacing other racks or the like holding means already in that path discharging the most remote rack or like holding means to a position ready for transferring, transferring last said rack or the like holding means to a position to be similarly passed by a further force into a further conveying path, with the above steps repeated as desired and causing a plurality of independent transverse flows of refrigerated air to pass over the articles being frozen while on the conveying path.
- In a further aspect the invention consists in apparatus for freezing articles comprising a blast freezing tunnel, a conveying path through said tunnel, racks or the like holding means for holding articles to be passed along said conveying path in said blast freezing tunnel, and force applying means having a movable head adapted in use to be applied to a rack or the like holding means and reciprocated over a distance, the construction and arrangement being such that in use, on the forward stroke of said force applying means one said rack or the like holding means is caused to enter said conveying path, and by coacting with the preceding rack or the like holding means thereon, displace the abutted racks or the like holding means on said conveying path to cause a remote rack or the like holding means in that path to be discharged, or positioned for discharge, therefrom, and on the rearward stroke of said force applying means said moving head is retracted so that a space is created for a further rack or the like holding means to be associated with said force applying means ready for the commencement of a further cycle.

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In a still further aspect the invention consists in apparatus for freezing articles comprising a blast freezing tunnel, a plurality of horizontal substantially parallel conveying paths having the ends thereof adjacent through said blast freezing tunnel, a plurality of racks or the like holding means for holding articles to be passed along said conveyor path for freezing, said racks or the like holding means having a substantially rectangular framework, including bearing or sliding surfaces on the base thereof, a plurality of corrugated shelves supported substantially parallel to the base of said framework, and a backing sheet covering or blanking off one face of said framework so that in use when the said racks or the like holding means are abutted together on said conveying path a plurality of separate transverse passageways are provided through each of said rack or the like holding means, transferring means for transferring said racks or the like holding means between the said conveying paths, and staggered force applying means adapted to apply a force to pass racks or the like holding means in to opposite ends of each said conveying path, the construction and arrangement being such that in use, a loaded rack or the like holding means is moved into position to be passed into the first conveying path by one said force applying means so as to displace the other racks or like holding means already in that path and cause the remote rack or the like holding means to be discharged therefrom onto a transferring means, which transferring means moves said rack or the like holding means to a position to be similarly passed by a further force applying means into a second conveying path, with the transferring means and force applying means repeated until the rack of frozen articles is discharged from the combined length of said conveying path and from said blast freezing tunnel.

One preferred form of the invention will now be described with reference to the accompanying drawings in which

Figure 1 is a side elevation showing a conveying apparatus according to the present invention and

Figure 2 is an end elevation of the conveying apparatus viewed from the operating end thereof.

For the preferred form of the invention a conveying means which has been designed particularly for use in conveying packaged meat through a blast freezing chamber will be described although as will be apparent the invention would be useful for conveying a wide range of other types of goods.

In the preferred conveying means two conveying paths 1 and 2 are positioned one above the other. The bottom conveying path 1 is formed from a framework of suitable channel members having at least some of the upper

surfaces thereof adapted to provide sliding or bearing surfaces for racks or the like holding means 3 to be passed therealong. A longitudinal locating rail 4 is incorporated in the conveying path 2 to assist in guiding the racks 3.

The conveying path 2 is supported by pillars 5 extending from the floor of the chamber at a sufficient height above the conveying path 1 to provide ample clearance for the racks 3 to pass along the conveying path 1. The conveying path 2 is similarly constructed to that above described in connection with the conveying path 1. End pillars 6 extending from the floor to the ceiling of the chamber are provided on either side of the ends of the conveying paths.

The length of the conveying path is dependent upon the particular requirement and in the preferred example each conveying path is fortyeight feet long.

A plurality of abutted racks 3 are held on each conveying path so that the end racks have the outer face thereof substantially flush with the end of the conveying path.

Each rack or the like holding means is formed from a suitable steel framework defining a rectangular carbinet. Four shelves 8 are supported substantially parallel to the base of the carbinet therefore dividing each carbinet into five separate supporting chambers adapted to receive cartons of packaged meat ready for freezing. The shelves 8 and the base of the carbinets are formed from corrugated metal having the base and the apex of the corrugations flattened. This facilitates better air circulation around the packages of meat during freezing. The back 9 of each carbinet is blanked off by a sheet of non-corrodable metal so that when the racks 3 are in the abutted position on the conveying paths the blanked off back of one carbinet closes the open end of the preceding carbinet thereby providing a plurality of transverse passageways through the racks. This also assists in directing and controlling the flow of cold air over the cartons being frozen.

Transfer means are provided adjacent either end of the conveying paths 1 and 2 and are adapted to move from a position in line with the conveying path 1 to a position in line with the conveying path 2. The transfer means at the loading and dispatch end of the conveying paths is formed by a platform 10 wider than the width of the conveying paths and of a depth sufficient to receive one rack 3. Hydraulic operating cylinders 11 are mounted on either side and extend from the upper surface of the platform 10. Structural frames 12 also extend from the upper surface of the platform 10 substantially in line with the end pillars 6 to provide additional support for each hydraulic cylinder 11. Flexible hydraulic fluid lines 13 are connected from a supply pipe to either end of the hydraulic

cylinder 11 in the normal manner. The piston ram or arm 14 of the hydraulic cylinder 11 is attached to the floor so that upon actuation of the hydraulic cylinder the platform 10 is caused to move from a position in line with the conveying path 1 to a position in line with the conveying path 2.

A similar transfer platform 10a is provided at the opposite end of the conveying paths. This platform is also operated by hydraulic cylinders 11a and a piston ram or arm 14a attached to the floor.

The transfer platforms 10 and 10a are controlled to operate in synchronism so that both platforms are either in line with one or the other of the conveying paths. In this way the effective length of the conveying path is increased by a distance equal to twice the width of one of the racks 3. In the cycle of operations which will be further described in more detail later upon operation of both transfer platforms one of the platforms only is carrying a rack 3. This loaded platform tends to lead or lag the unloaded platform dependent upon whether the loaded platform is being raised or lowered. However any further step in the cycle is prevented until both transfer platforms have actually completed their full distance of travel.

A force applying means 15 is positioned adjacent the loading and dispatch end of the conveying paths to cause a rack 3 to be displaced from the platform 10a onto the conveying path 2. The force applying means comprises two hydraulically operated cylinders 16 having a movable head 17 attached to each piston ram or arm. The head 17 has a flat face adapted to coact with the sides of a rack 3 and is reinforced with strengthening gussets extending backwardly and normal to this face. Flexible hydraulic leads 18 are provided to supply the hydraulic liquid to either ends of the cylinder 16 in the usual manner. The cylinder is supported by a channel 19 suspended from the ceiling with angle bracing members 20 used to give the supporting framework sufficient strength. A guiding rod 26a is attached to the top of the movable head 17 and extends rearwardly through the member 19 and a further guiding member 21 to ensure the movable head 17 coacts with the side of the racks 3. A limit switch 22 is mounted on the back of the member 19 and an actuating arm extends rearwardly from the top of the arm 17 to coact with this limit switch 22 when the movable head is in the fully retracted position.

A control panel also suspended from the ceiling is positioned towards one side of the force applying means 15 and includes a control mechanism adapted to control the apparatus to circulate the rack 3 through the conveying paths 1 and 2 as will be further described later.

A further force applying means 24 is positioned at the opposite end of the conveying paths and diametrically opposed to the force applying means 15 that is in a position to move a rack 3 from the platform 10a into the conveying path 1. The force applying means 24 also comprises hydraulically operated cylinders 16a supported on frames 25 extending from the top of each movable pushing head 17a and a limit switch 27 is mounted to coact with part of the movable head when in the fully retracted position.

Referring now also to Figure 2 six evaporators 28 and 28a are positioned on each side of the framework between the conveying path 1 and the conveying path 2. Two fans 29 are positioned above each of the evaporators 28 and between the conveying path 2 and the ceiling of the chamber.

The chamber is completed by partition walls 30 and 31 thereby confining the space around the conveying paths and evaporators so that the fans 29 may act as air circulating means to circulate a blast of cold air through the cartons of packaged meat supported on the racks 3.

With the above described apparatus the discharge point, that is, where the racks 3 are discharged from the conveying tunnel 1 on to the platform 10 and the entrance point, that is, where the racks 3 are displaced from the platform 10 into the conveying path 2 are positioned adjacent one to the other. This provides a convenient means of unloading treated cartons from the rack discharged from the conveying path 1 and replacing these by untreated cartons prior to the same rack being pushed into the conveying path 2 by the force applying means 15. The loading and unloading is more easily effected by controlling the movement of the platform 10. Accordingly the control mechanism is arranged so that the movement of the platform 10 is intermittent and may be manually controlled as it moves from a position in line with conveying path 1 to a position in line with the conveying path 2. Thus the cartons from the various shelves 8 may be removed and replaced at the most convenient height for the operator.

Once the platform is in position in line with the conveying path 2 the remaining sequence of operations is effected automatically without further action required on the part of the operator until the next rack 3 is discharged onto the platform 10 when it is again in the lowered position in line with the conveying path 1.

The use and cycle of operations of the above described apparatus will now be described in detail. The cycle will be commenced for convenience with the transfer platforms 10 and 10a in the raised position as shown in Figure 1. It will be assumed cartons of meat have been loaded into the

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rack 3a positioned on the transfer platform 10 and also in order that the complete operation of the machine may be described it will be assumed that all the racks in the conveying paths 1 and 2 have previously been loaded with cartons of meat to be frozen.

When the platform 10 reaches the position in line with the conveying path 2 the control mechanism automatically actuates the force applying means 15 and the cylinders 16 cause the forward stroke of the movable heads 17 thereby pushing the rack 3a on the platform 10 into the conveying path 2. This rack, by coacting with the preceding rack on the conveying path displaces the abutted racks already on the conveying path to cause the remote rack 3b in that path to be discharged onto platform 10a. The movable heads 17 are then retracted until the limit switch 22 is actuated.

When the rack is positioned on platform 10a both transfer platforms are automatically operated to move to a position in line with the conveying path 1 as shown in dotted outline in Figure 1. The rack 3b is now supported on platform 10a in line with conveying path 1 and the force applying means 24 is automatically operated. As was above described this step will not commence until the platform 10, which, because it is unloaded may lag the platform 10a slightly, is in the correct position. The force applying means 14 then operates in a similar manner to that above described in connection with the force applying means 15 to discharge the remote rack 3c in the conveying path 1 onto the platform 10. The period taken for the passage of the rack 3c from the introduction to the conveying path 2 until it is discharged from the end of the conveying path 1 is sufficient to ensure the heat is frozen and this may readily be controlled by spacing the operating cycle to ensure the meat has sufficient time in the blast freezing chamber.

The frozen cartons on the rack 3c discharged onto platform 10 are removed and replaced by cartons to be frozen and as was above described movement of the platform 10 from a position in line with the conveying path 1 to a position in line with the conveying path 2 may be manually controlled to allow this loading and unloading to be effected. The rack 3c loaded with unfrozen cartons of meat is then in a position to be pushed into the conveying path 2 at the commencement of a further cycle.

The temperature in the freezing chamber is controlled by evaporators 28 and 28a which are connected and have a refrigerant passing therethrough in the normal manner. The fans 29 are also operated to cause a plurality of transverse flows of air through the refrigerating chamber. The circulation of air is from the evaporator unit 28 through the fan 29

to pass through the racks on the conveying path 2. This air then passes through the evaporators 28a and returns to the evaporator 28 through the racks on the lower conveying path 1. The separate transverse passage ways provided through the abutted racks 3 as was above described ensures a positive circulation of air around each of the packages being frozen. The corrugated base on each shelf 8 also assists in providing this complete circulation of air about the packages being frozen.

It will be apparent that this particular type of conveying apparatus need not be restricted to use for conveying articles or goods through a blast freezing chamber. Also while a battery of two conveying paths has been particularly described it would be possible to repeat this apparatus the required number of times by staggering the force applying means and transfer means to ensure a continuous circulation of the racks through the various individual conveying paths.

Also while it will be apparent that considerable advantage is obtained by having the discharge and entrance points adjacent one another to allow for ease of loading and unloading in certain circumstances it may be preferable to have these at a spaced relationship for example at opposite ends of a conveying path.

WHAT WE CLAIM IS:—

1. A method of freezing articles comprising the steps of loading a rack or the like holding means with articles to be frozen, moving said loaded rack or the like holding means to a position ready to be passed into one conveying path, applying a force to cause said rack or the like holding means to enter said conveying path through a blast freeze tunnel and by displacing other racks or the like holding means already in that path discharging the most remote rack or like holding means to a position ready for transferring, transferring last said rack or the like holding means to a position to be similarly passed by a further force into a further conveying path, with the above steps repeated as desired and causing a plurality of independent transverse flows of refrigerated air to pass over the articles being frozen while on the conveying path.

2. A method as claimed in Claim 1, when two or more horizontal substantially parallel conveying paths are used having the ends thereof adjacent one another, including the steps of passing said racks or the like holding means through the combined lengths of said conveying paths and transferring said rack or the like holding means displaced from the discharge end of said combined lengths of said conveying path to a position ready to enter the loading or entrance of said combined lengths of said conveying path to allow a continuous circulation of said articles, racks

or the like holding means with frozen articles being removed during one transferring step and replaced by unfrozen articles.

3. A method as claimed in Claim 2, when
 5 two said conveying paths are used and are mounted one above the other, including the step of moving said racks or the like holding means from a position in line with the discharge end of the bottom conveying path
 10 to a position in line with the entrance end of the top conveying path in a manner such that frozen articles on the rack or the like holding means discharged from said bottom conveying path may be removed therefrom
 15 and replaced by unfrozen articles so that said rack or the like holding means is ready to be entered into said top conveying path.

4. A method as claimed in Claim 3, including the steps of manually operating actuating means to move said racks or the like holding means during loading and unloading and automatically operating actuating means to control the remaining sequence of operations.

5. A method of conveying articles when conducted substantially as herein described with reference to the accompanying drawings.

6. Apparatus for freezing articles comprising a blast freezing tunnel, a conveying path
 30 through said tunnel, racks or the like holding means for holding articles to be passed along said conveying path in said blast freezing tunnel, and force applying means having a movable head adapted in use to be applied
 35 to a rack or the like holding means and reciprocated over a distance, the construction and arrangement being such that in use, on the forward stroke of said force applying means one said rack or the like holding means is
 40 caused to enter said conveying path, and by coacting with the preceding rack or the like holding means thereon, displace the abutted racks or the like holding means on said conveying path to cause a remote rack or the like
 45 holding means in that path to be discharged, or positioned for discharge, therefrom, and on the rearward stroke of said force applying means said moving head is retracted so that a space is created for a further rack or the
 50 like holding means to be associated with said force applying means ready for the commencement of a further cycle.

7. Apparatus for freezing articles comprising a blast freezing tunnel, a plurality of
 55 horizontal substantially parallel conveying paths having the ends thereof adjacent, said blast freezing tunnel, a plurality of racks or the like holding means for holding articles to be passed along said conveying
 60 path for freezing, said racks or the like holding means having a substantially rectangular framework, including bearing or sliding surfaces on the base thereof, a plurality of corrugated shelves supported substantially parallel
 65 to the base of said framework, and a back-

ing sheet covering or blanking off one face of said framework so that in use when said racks or the like holding means are abutted together on said conveying path a plurality
 70 of separate transverse passageways are provided through each of said rack or the like holding means, transferring means for transferring said racks or the like holding means between the said conveying paths, and staggered force applying means adapted to apply
 75 a force to pass racks or the like holding means in to opposite ends of each said conveying path, the construction and arrangement being such that in use, a loaded rack or the like holding means is moved into position
 80 to be passed into the first conveying path by one said force applying means so as to displace the other racks or like holding means already in that path and cause the remote rack or the like holding means to be discharged therefrom onto a transferring means,
 85 which transferring means moves said rack or the like holding means to a position to be similarly passed by a further force applying means into a second conveying path, with the transferring means and force applying means being repeated until the rack of frozen articles is discharged from the combined length of
 90 said conveying path and from said blast freezing tunnel.

8. Apparatus as claimed in Claim 6 or Claim 7, wherein said conveying path comprises a suitable structural framework including guiding rails adapted to provide a bearing
 100 and sliding surface to coact with complementary bearing portions on the base of said racks or the like holding means.

9. Apparatus as claimed in any one of Claims 6 to 8, wherein said force applying means comprise hydraulic operated pushing
 105 arms adapted to coact with either side of said racks or the like holding means so that on the forward stroke of said hydraulic arm said rack or the like holding means is displaced from a holding platform and caused to
 110 enter said conveying path and on the rearward stroke said hydraulically operating arms are retracted so that a space is created for a further rack or the like holding means to be moved into position with said holding platform.
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10. Apparatus as claimed in any one of Claims 7 to 9, wherein the loading station from which said rack or the like holding means is caused to enter said conveying
 120 path, and the discharge station into which a rack or the like holding means is discharged from said conveying path, are provided at opposite ends of the combined length of said conveying path, and are disposed adjacent
 125 one to the other.

11. Apparatus as claimed in Claim 10, wherein two said conveying paths are provided positioned adjacent and parallel one
 130 to the other, with transfer means provided at

each end of said conveying paths, and with staggered force applying means also provided at each end of said conveying path, the construction and arrangement being such that in use, said racks or the like holding means are passed from said loading station through the combined length of said conveying paths to said discharge station, and back to said loading station to provide a continuous circulation of said racks or the like holding means.

12. Apparatus as claimed in Claim 11, wherein said conveying paths are mounted one above the other, with transfer means provided by platforms adjustable between the levels of each said conveying paths, and with force applying means provided at opposite ends of said conveying paths, and adapted to operate in conjunction with said conveying paths to cause a continuous circulation of said racks or the like holding means, the construction and arrangement being such that in use, said racks or the like holding means are moved through said dispatching and loading stations positioned at one end of said conveying paths to enable the frozen articles to be removed from said racks or the like holding frames and unfrozen articles to be loaded thereon.

13. Apparatus as claimed in any one of Claims 6 to 12, wherein said transfer means each comprise a hydraulic operated holding platform of a size sufficient to hold one said rack or the like holding means, the construction and arrangement being such that in use, said platform is adapted to be moved between a position in line with the base of one said conveying path to a position in line with the base of the other said conveying path so that in one position said platform may receive a rack when discharged from the conveying path and in the other position said platform provides support to hold said rack or the like holding means in position ready to be passed into said conveying path by force applying means.

14. Apparatus as claimed in any one of Claims 6 to 13, wherein said transfer means at either end of said conveyor paths are synchronised to operate together.

15. Apparatus as claimed in any one of Claims 11 to 14, wherein said force applying means adjacent the loading and dispatch end

of said conveying paths is adapted to pass a loaded rack or the like holding means into the one conveying path and a further force applying means is adapted to pass said racks or the like holding means from the transfer means into the other conveying path at the opposite end thereof.

16. Apparatus as claimed in any one of Claims 11 to 15, wherein manually operated actuating means are provided to control said transfer means so that the platform is intermittently moved from a position in line with said second conveying path to a position in line with said first conveying path so that frozen articles on the rack or like holding means discharged from said second conveying path may be removed therefrom and replaced by unfrozen articles ready to enter said first conveying path.

17. Apparatus as claimed in Claim 16, wherein automatic actuating means are provided to automatically control the remaining cycle of operations.

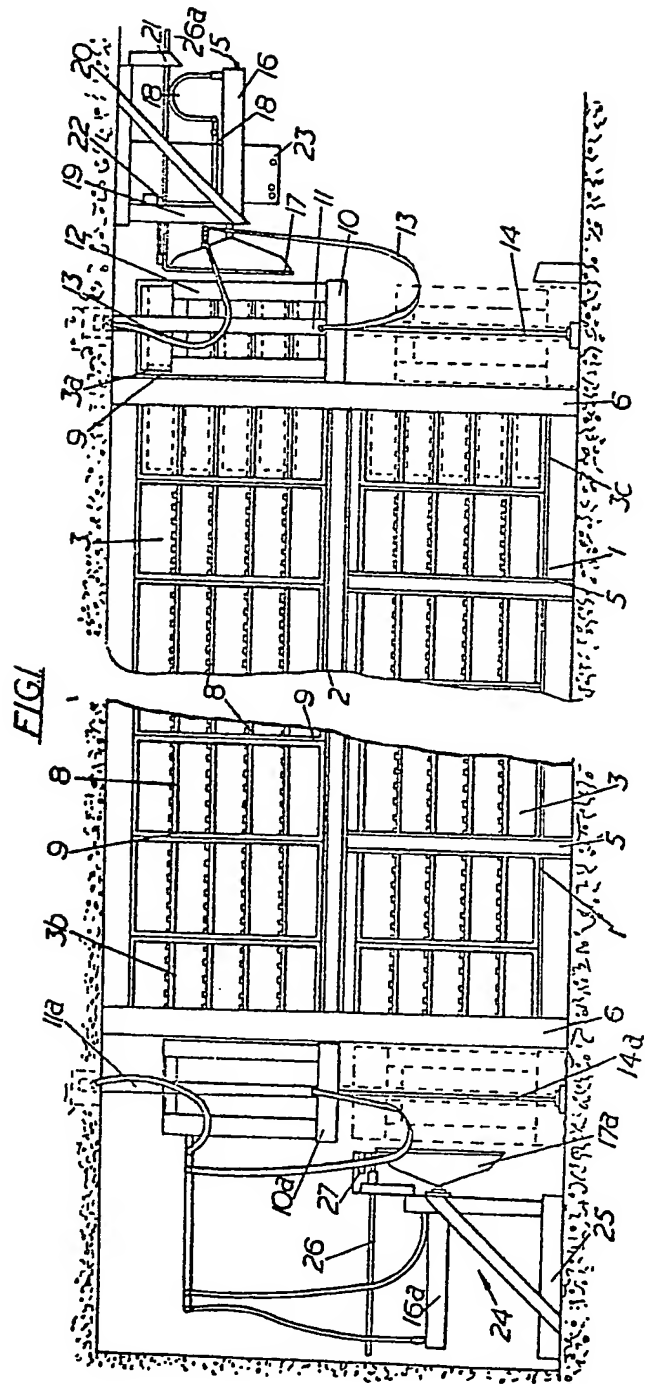
18. Apparatus according to any one of Claims 6 to 17, wherein said articles to be frozen are packages of prepacked meat.

19. Apparatus as claimed in any one of Claims 7 to 18, wherein air circulating means are positioned adjacent one side of the top said conveying path in said blast freezing tunnel and with evaporators positioned on either side of the bottom said conveying path the construction and arrangement being such that air is circulated by said air circulating means, through the rack on the top conveying path, through an evaporator on one side of the lower conveying path, through the racks on the lower conveying path, and through the evaporator on the opposite side of said lower conveying path, to return back through said air circulating means to complete said cycle.

20. Apparatus for freezing articles when constructed, arranged and operable substantially as herein described with reference to the accompanying drawings.

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2 SHEETS

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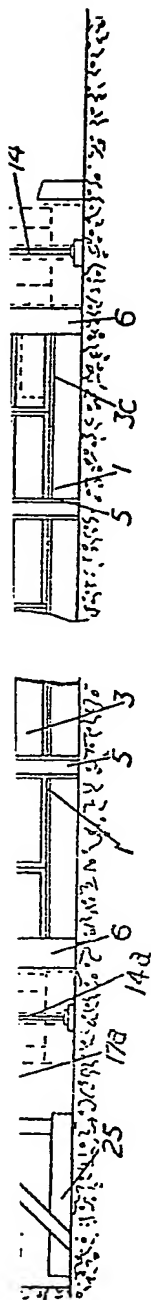
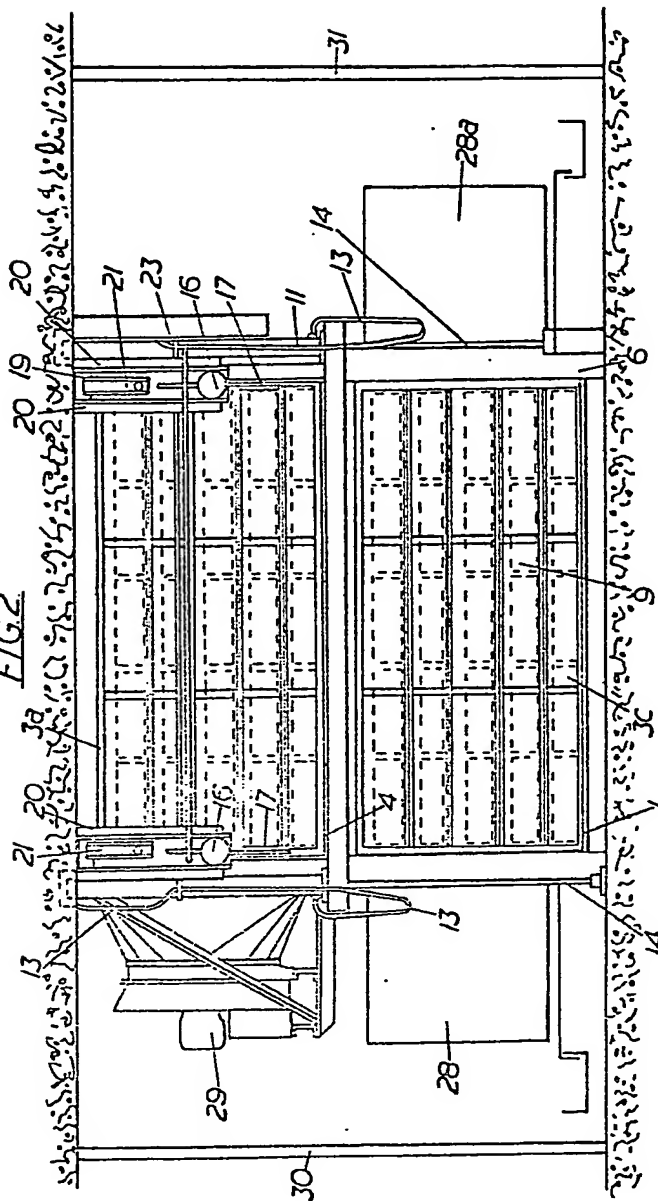


FIG. 2



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 Sheets 1 & 2

